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An environmental liability and risk management approach to landfill groundwater quality monitoring in South Africa.

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DECLARATION

I declare that this research report is my own unaided work. It has never been submitted for any degree or examination in any University or carried out by any institution before.

…….

Thokozani H. Dlamini

Date: ……

DEDICATION

To my aunt Gladys Mahlalela and my late uncle H.R.H. Prince Duma.

To all those who still believe in the power of hardwork and are inspired by God’s creation and his presence. To all those who bring development yet keep in mind the importance of its sustainability and the improvement of the quality of life.

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Lastly, I would also like to thank the case study landfill operator for allowing me to use their geohydrological assessment reports. They have requested to remain anonymous in this report.

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ABSTRACT

Governments and companies are continually faced with a challenge to effectively manage all risks so as to protect their assets, financial health, property, reputation, constituents, and natural resources. “Risk management is the decision-making process whereby a policy or regulation is developed after a risk has been identified and is integrated with other issues including political, social, historical, and economic factors” (Zondi, 2000).

In South Africa, environmental risk (i.e. risks associated with environmental damage and compliance) in waste management is currently considered in the setting of standards for landfill siting, design and water quality monitoring. It is the author’s opinion that this current approach has been poorly managed because potential sources of major environmental liability have not been identified and quantified (DWAF, 1998).

Environmental liability is defined as the obligation to compensate or restore the environmental damage caused by the past, use, release, or threatened release of a particular substance; or by other activities that adversely affect the environment and/or human health (ICMA, 2001).

The author looks at a case study of a landfill in Johannesburg highlighting their implementation of the water quality monitoring plan and proposes that the monitoring plan be integrated into a proposed environmental liability and risk management approach to managing ground water pollution from landfill sites.

As not every landfill is the same as the other, a comprehensive analysis as stated in the Department of Water Affairs and Forestry (DWAF) Minimum Requirements (1998) is used to gather a list of relevant parameters for that landfill. The comprehensive analysis constitutes macro-constituents and all other constituents likely to be present in quantities higher than the normal background values or to contaminate the groundwater storage (aquifer) in the future. Once done, the landfill operator can then discuss with the Department of Environmental Affairs and Tourism (DEAT) on how to prioritise the parameters. They would also decide which

parameters are to be used for the regular indicator analysis when monitoring because of cost reasons. All the parameters above background value are to be used as environmental liability parameters for that landfill site.

The indicator analysis constitutes measurement of the most likely parameters that would, at an early stage, indicate the possibility of groundwater pollution. It is to be used in the regular monitoring exercises at the landfill by the operator. If an indicator parameter exceeds standards, a full comprehensive analysis must be performed and reported to DEAT.

Each environmental liability parameter will be assigned a penalty charge and weight depending on a number of factors including:

- Location of the landfill i.e. distance to acquifer and GW level
- Geology of area
- Type of aquifer
- Type of landfill i.e. General of Hazardous
- Risk level of that parameter to human health i.e. Health Risk Assessment

The author proposes the introduction of an environmental liability costs fund with a compulsory monthly fee, which will be set up by both the landfill operator and the relevant government department. The water quality monitoring protocol will not differ much from the present structure. If pollution is shown during detection monitoring and a further detailed investigation indicates that exposure is higher than allowable limits, then a combined environmental liability penalty will be evaluated and the monetary value will be charged into the landfill operator's account in the liability costs fund, although the landfill operator and DEAT can decide to use another method to determine the environmental liability e.g. liability insurance assessors. If the penalty required exceeds what has been accumulated in the liability fund account, then the difference will be demanded directly from the landfill operator. If the quarterly monitoring reports compiled by the operators show no mitigation claims into the liability find then the money accumulates in their account and a certain percentage will be paid back to the landfill operator as an incentive.